AMENDMENTS TO THE CLAIMS

Please amend claims 1, 9, 10, and 16, and cancel claims 6 and 8, as set forth in the listing of claims that follows:

1. (Currently Amended) An ultra-accurate gas injection device for injecting into an air stream a flow of gas to simulate exhaust gas flow into a system, said device comprising:

~~at least one mass flow device, the flow of gas flowing through said mass flow device at an actual gas flow rate; and~~

an air flow device comprising an air blower for creating said air stream, an electronic throttle control (ETC) valve adapted to regulate air input to the blower to thereby adjust the air stream, and an airmeter adapted to measure an actual air flow rate of said air stream, ~~the flow of air flowing through said air flow device at an actual air flow rate to form the airstream, wherein the gas enters the airstream to simulate the exhaust gas flow into the system,~~ and

at least one mass flow device adapted to be connected to a gas supply, said mass flow device being connected to the air stream and adapted to control flow of gas to the air stream at an actual gas flow rate, wherein the gas enters the air stream to simulate the exhaust gas flow into the system.

2. (Original) The ultra-accurate gas injection device of claim 1, wherein said mass flow device is a pintle valve.

3. (Original) The ultra-accurate gas injection device of claim 1, wherein said mass flow device is an exhaust gas recirculation (EGR) valve.

4. (Original) The ultra-accurate gas injection device of claim 1, wherein said gas is selected from a group consisting of carbon monoxide, nitrogen oxides, carbon dioxide, nitrogen, hydrocarbons, and any combination thereof.

5. (Original) The ultra-accurate gas injection device of claim 4, wherein said device includes more than one mass flow devices, wherein a different gas is flowing through each of said mass flow devices.

6. (Cancelled)

7. (Currently Amended) The ultra-accurate gas injection device of claim 1 ~~6~~, wherein said valve has a response time of approximately 150 ms.

8. (Cancelled)

9. (Currently Amended) The ultra-accurate gas injection device of claim 1 ~~6~~, wherein said blower operates to move the air at approximately 250 g/s.

10. (Currently Amended) The ultra-accurate gas injection device of claim 1 ~~6~~, wherein said air flow device includes a manifold.

11. (Original) The ultra-accurate gas injection device of claim 10, further comprising a plurality of transducer/thermocouple devices.

12. (Original) The ultra-accurate gas injection device of claim 11, wherein said manifold is positioned between said valve and said blower, and wherein a first transducer/thermocouple device is positioned upstream of said valve, a second transducer/thermocouple device is positioned between said valve and said manifold, and a third transducer/thermocouple device is positioned between said manifold and said blower.

13. (Original) The ultra-accurate gas injection device of claim 1, further comprising:

an input device for inputting setpoint data, said setpoint data including a target gas flow rate for the flow of gas into the air stream and a target air flow rate for the flow of air into the system; and

a controller connected to said input device, said mass flow device, and said air flow device.

14. (Original) The ultra-accurate gas injection device of claim 13 wherein said controller is a PC based controller.

15. (Original) The ultra-accurate gas injection device of claim 13 wherein:

said mass flow device issues a gas flow rate signal indicative of at least said actual gas flow rate, said mass flow device receives a gas flow control signal and is configured to control said actual gas flow rate dependent at least in part upon said gas flow control signal,

said air flow device issues an air flow rate signal indicative of at least said actual air flow rate, said air flow device receives an air flow control signal and is configured to control said actual air flow rate dependent at least in part upon said air flow control signal,

said controller receives said setpoint data from said input device and issues said gas flow control signal and said air flow control signal,

said gas flow control signal being dependent at least in part upon said target gas flow rate contained within said setpoint data, said controller comparing said actual gas flow rate with said target gas flow rate and adjusting said gas flow rate signal depending at least in part upon said comparison of said actual gas flow rate with said target gas flow rate, said controller being configured to adjust said gas flow control signal such that said actual gas flow rate is substantially equal to said target gas flow rate,

said air flow control signal being dependent at least in part upon said target air flow rate contained within said setpoint data, said controller comparing said actual air flow rate with said target air flow rate and adjusting said air flow rate signal depending at least in part upon said comparison of said actual air flow rate with said target air flow rate, said controller being configured to adjust said air flow control signal such that said actual air flow rate is substantially equal to said target air flow rate.

16. (Currently Amended) The ultra-accurate gas injection device of claim 15, wherein said setpoint data includes at least one of a start time and a stop time, said start time corresponding to a time at which the flow of gas through said mass flow ~~controller~~ device and the flow of air through the air control device is to begin, and said stop time corresponding to a time at which the flow of gas through said mass flow ~~controller~~ device and the flow of air through the air control device is to cease, said controller being configured to start the flow of gas and air at said start time and to stop the flow of gas and air at said stop time by adjusting said gas flow control signal and said air flow control signal accordingly.

17. (Original) The ultra-accurate gas injection device of claim 15, wherein said input device comprises at least one of a keyboard, a numeric keypad, a mouse, ethernet, internet, profibus, CAN, RS-485, RS-232 and a touch screen display.

18. (Original) The ultra-accurate gas injection device of claim 15, wherein at least one of said target air flow rate and said target gas flow rate vary as a function of time.

19. (Original) The ultra-accurate gas injection device of claim 13, further comprising:

an output device connected to said controller, wherein said controller issues an output signal dependent at least in part upon at least one of said gas flow rate signal and said air flow rate signal, and wherein said output device receives said output signal and indicates at least one of said actual gas flow rate and said actual air flow rate.

20. (Original) The ultra-accurate gas injection device of claim 19, wherein said output device comprises at least one of a cathode ray tube, a flat panel display, a liquid crystal display, and a touch screen display.

21. (Original) The ultra-accurate gas injection device of claim 19, wherein said setpoint data includes a time period, said PC based controller counting said time period and stopping the flow of gas and through said at least one mass flow controller by adjusting said gas flow control signal and the flow of air through said air flow device by adjusting said air flow control signal upon the expiration of said time period.

22. (Original) The ultra-accurate gas injection device of claim 21, wherein said output device indicates at least one of said time period and said counting of said time period.

23. (Original) A method of injecting a precise concentration of at least one gas into an air stream to simulate exhaust gas flow into external system of known volume, said method comprising the steps of:

determining a desired concentration of each at least one gas to be contained within the air stream;

selecting a desired gas flow rate at which the at least one gas is injected into the air stream;

calculating a time period during which the at least one gas is injected into the air stream, said time period determined at least in part by said desired gas concentration, said desired gas flow rate and the volume of the external system;

selecting a desired air flow rate at which the air is injected into the external system;

calculating a time period during which the air stream is injected into the external system, said time period determined at least in part by said desired gas concentration, said desired air flow rate and the volume of the external system;

moving the stream of air into the external system at an actual air flow rate;

controlling said actual air flow rate with an air flow device;

injecting at an actual gas flow rate the at least one gas into the air stream;

controlling said actual gas flow rate with a mass flow device; and

ceasing said injecting of said gas into the air stream and said moving of said air stream into the external system upon the expiration of said time period.

24. (Original) The method of injecting of claim 23, wherein said mass flow device is an exhaust gas recirculation (EGR) valve.

25. (Original) The method of injecting of claim 23, wherein the gas is selected from the group consisting of carbon monoxide, nitrogen oxides, carbon dioxide, nitrogen, hydrocarbons, and any combination thereof.

26. (Original) The method of injecting of claim 23, further comprising:

inputting said desired gas flow rate and said time period to a PC based controller, said PC based controller receiving a gas flow rate signal and issuing a gas flow control signal dependent at least in part upon said gas flow rate signal;

inputting said desired air flow rate and said time period to said PC based controller, said PC based controller receiving an air flow rate signal and issuing an air flow control signal dependent at least in part upon said air flow rate signal;

said air flow device issuing said air flow rate signal and receiving said air flow control signal, said air flow device adjusting said actual air flow rate dependent at least in part upon said air flow control signal;

adjusting said air flow control signal such that said actual air flow rate is substantially equal to said desired air flow rate;

said mass flow device issuing said gas flow rate signal and receiving said gas flow control signal, said mass flow device adjusting said actual gas flow rate dependent at least in part upon said gas flow control signal; and

adjusting said gas flow control signal such that said actual gas flow rate is substantially equal to said desired gas flow rate.

27. (Original) The method of injecting of claim 26, wherein said air flow device includes a valve and an airmeter, said valve receiving said air flow control signal and said airmeter issuing said air flow rate signal.

28. (Original) The method of injecting of claim 27, wherein said air flow device includes a blower that move the air into said external system.

29. (Original) The method of injecting of claim 27, wherein said valve includes a throttle, and wherein the step of controlling said actual air flow rate is through the use of a throttle.

30. (Original) The method of injecting of claim 26, wherein said ceasing step comprises adjusting said air flow control signal and gas flow signal so that the stream of air stops flowing into the external system.

31. (Original) The method of injecting of claim 26, wherein said inputting step comprises inputting a start time and a stop time, said start time corresponding to a time at which said injecting step and said air flow movement step is to commence and said stop time corresponding to a time at which said injecting step and said air flow movement step is to cease.

32. (Original) The method of injecting of claim 26, comprising the further step of indicating with an output device at least one of said actual flow rate of the gas, said actual air flow rate of the gas, the amount of time during which said injecting step and air flow movement step have been active, a period of time remaining during which said injecting step and air movement step will be active, said start time, said stop time, said desired gas flow rate, said desired air flow rate, and a mass of the gas contained within the external system.

33. (Original) A method of injecting into an air stream a desired concentration of at least one gas to simulate exhaust gas flow into an external system, the external system having a known volume, the desired concentration of the injected gas in the external system being substantially equal to the concentration of the at least one gas contained within an exhaust of one of an ultra-low emissions vehicle and a super-ultra-low emissions vehicle, comprising the steps of:: ·

determining a desired concentration of each at least one gas to be contained within the air stream;

selecting a desired gas flow rate at which the at least one gas is injected into the air stream;

calculating a time period during which the at least one gas is injected into the air stream, said time period determined at least in part by said desired gas concentration, said desired gas flow rate and the volume of the external system;

inputting said desired gas flow rate and said time period to a PC based controller, said PC based controller receiving a gas flow rate signal and issuing a gas flow control signal dependent at least in part upon said gas flow rate signal;

selecting a desired air flow rate at which the air is injected into the external system;

calculating a time period during which the air stream is injected into the external system, said time period determined at least in part by said desired gas concentration, said desired air flow rate and the volume of the external system;

inputting said desired air flow rate and said time period to said PC based controller, said PC based controller receiving an air flow rate signal and issuing an air flow control signal dependent at least in part upon said air flow rate signal;

moving at an actual air flow rate the stream of air into the external system;

controlling said actual air flow rate with an air flow device, said air flow device issuing said air flow rate signal and receiving said air flow control signal, said air flow device adjusting said actual air flow rate dependent at least in part upon said air flow control signal;

adjusting said air flow control signal such that said actual air flow rate is substantially equal to said desired air flow rate;

injecting at an actual gas flow rate the at least one gas into the air stream;

controlling said actual gas flow rate with a mass flow device, said mass flow device issuing said gas flow rate signal and receiving said gas flow control signal, said mass flow device adjusting said actual gas flow rate dependent at least in part upon said gas flow control signal;

adjusting said gas flow control signal such that said actual gas flow rate is substantially equal to said desired gas flow rate; and

ceasing said injecting of said gas into the air stream and said moving of said air stream into the external system upon the expiration of said time period.

34. (Original) A method of calibrating an instrument capable of measuring a very low concentration of at least one gas within a system, said method comprising the steps of:

determining a minimum concentration of gas the instrument is capable of measuring;

simulating the movement of exhaust gas into an external system of known volume, said simulation step comprising:

selecting a desired gas flow rate at which the at least one gas is injected into the air stream;

calculating a time period during which the at least one gas is injected into the air stream, said time period determined at least in part by said desired gas concentration, said desired gas flow rate and the volume of the external system;

inputting said desired gas flow rate and said time period to a PC based controller, said PC based controller receiving a gas flow rate signal and issuing a gas flow control signal dependent at least in part upon said gas flow rate signal;

selecting a desired air flow rate at which the air is injected into the external system;

calculating a time period during which the air stream is injected into the external system, said time period determined at least in part by said desired gas concentration, said desired air flow rate and the volume of the external system;

inputting said desired air flow rate and said time period to said PC based controller, said PC based controller receiving an air flow rate signal and issuing an air flow control signal dependent at least in part upon said air flow rate signal;

moving at an actual air flow rate the stream of air into the external system;

controlling said actual air flow rate with an air flow device, said air flow device issuing

said air flow rate signal and receiving said air flow control signal, said air flow device adjusting said actual air flow rate dependent at least in part upon said air flow control signal;

adjusting said air flow control signal such that said actual air flow rate is substantially equal to said desired air flow rate;

injecting at an actual gas flow rate the at least one gas into the air stream;

controlling said actual gas flow rate with a mass flow device, said mass flow device issuing said gas flow rate signal and receiving said gas flow control signal, said mass flow device adjusting said actual gas flow rate dependent at least in part upon said gas flow control signal;

adjusting said gas flow control signal such that said actual gas flow rate is substantially equal to said desired gas flow rate;

ceasing said injecting of said gas into the air stream and said moving of said air stream into the external system upon the expiration of said time period,

measuring the concentration of gas in the external system with the instrument;

comparing the measured concentration of the at least one gas with the concentration of the at least one gas contained within the external system; and

adjusting the instrument until the measured concentration of the at least one gas is substantially equal to the concentration of the at least one gas contained within the external system.